

taking into account the phase-in option provided in paragraph (f)(1) of this section. For every engine that is certified early, the manufacturer may reduce the number of engines that are required by paragraph (f)(1) of this section to meet evaporative standards listed in paragraph (b) of this section by one engine.

(3) Manufacturers certifying engines to a voluntary NO<sub>x</sub> standard of 0.10 g/bhp-hr (without using credits) in addition to all of the applicable standards listed in paragraphs (a) and (b) of this section prior to model year 2008 may reduce the number of engines that are required to meet the NO<sub>x</sub> and NMHC standards listed in paragraph (a) of this section in model year 2008 and/or 2009, taking into account the phase-in option provided in paragraph (f)(1) of this section. For such every engine that is certified early, the manufacturer may reduce the number of engines that are required by paragraph (f)(1) of this section to meet the NO<sub>x</sub> and NMHC standards listed in paragraph (a) of this section by two engines.

(g) For model years prior to 2012, for purposes of determining compliance after title or custody has transferred to the ultimate purchaser, for engines having a NO<sub>x</sub> FEL no higher than 0.50 g/bhp-hr, the applicable compliance limits for NO<sub>x</sub> and NMHC shall be determined by adding 0.10 g/bhp-hr to the otherwise applicable standards or FELs for NO<sub>x</sub> and NMHC.

[66 FR 5165, Jan. 18, 2001, as amended at 75 FR 22978, Apr. 30, 2010]

#### § 86.010-2 Definitions.

The definitions of § 86.004-2 continue to apply to 2004 and later model year vehicles. The definitions listed in this section apply beginning with the 2010 model year.

*DTC* means diagnostic trouble code.

*Engine or engine system* as used in §§ 86.007-17, 86.007-30, 86.010-18, and 86.010-38 means the engine, fuel system, induction system, aftertreatment system, and everything that makes up the system for which an engine manufacturer has received a certificate of conformity.

*Engine start* as used in § 86.010-18 means the point when the engine reaches a speed 150 rpm below the nor-

mal, warmed-up idle speed (as determined in the drive position for vehicles equipped with an automatic transmission). For hybrid vehicles or for engines employing alternative engine start hardware or strategies (e.g., integrated starter and generators.), the manufacturer may use an alternative definition for engine start (e.g., key-on) provided the alternative definition is based on equivalence to an engine start for a conventional vehicle.

*Functional check*, in the context of onboard diagnostics, means verifying that a component and/or system that receives information from a control computer responds properly to a command from the control computer.

*Ignition cycle* as used in § 86.010-18 means a cycle that begins with engine start, meets the engine start definition for at least two seconds plus or minus one second, and ends with engine shut-off.

*Limp-home operation* as used in § 86.010-18 means an operating mode that an engine is designed to enter upon determining that normal operation cannot be maintained. In general, limp-home operation implies that a component or system is not operating properly or is believed to be not operating properly.

*Malfunction* means the conditions have been met that require the activation of an OBD malfunction indicator light and storage of a DTC.

*MIL-on DTC* means the diagnostic trouble code stored when an OBD system has detected and confirmed that a malfunction exists (e.g., typically on the second drive cycle during which a given OBD monitor has evaluated a system or component). Industry standards may refer to this as a confirmed or an active DTC.

*Onboard Diagnostics (OBD) group* means a combination of engines, engine families, or engine ratings that use the same OBD strategies and similar calibrations.

*Pending DTC* means the diagnostic trouble code stored upon the detection of a potential malfunction.

*Permanent DTC* means a DTC that corresponds to a MIL-on DTC and is stored in non-volatile random access memory (NVRAM). A permanent DTC can only be erased by the OBD system

itself and cannot be erased through human interaction with the OBD system or any onboard computer.

*Potential malfunction* means that conditions have been detected that meet the OBD malfunction criteria but for which more drive cycles are allowed to provide further evaluation prior to confirming that a malfunction exists.

*Previous-MIL-on DTC* means a DTC that corresponds to a MIL-on DTC but is distinguished by representing a malfunction that the OBD system has determined no longer exists but for which insufficient operation has occurred to satisfy the DTC erasure provisions.

*Rationality check*, in the context of onboard diagnostics, means verifying that a component that provides input to a control computer provides an accurate input to the control computer while in the range of normal operation and when compared to all other available information.

*Similar conditions*, in the context of onboard diagnostics, means engine conditions having an engine speed within 375 rpm, load conditions within 20 percent, and the same warm up status (i.e., cold or hot). The manufacturer may use other definitions of similar conditions based on comparable timeliness and reliability in detecting similar engine operation.

[74 FR 8369, Feb. 24, 2009]

**§ 86.010-18 On-board Diagnostics for engines used in applications greater than 14,000 pounds GVWR.**

(a) *General*. According to the implementation schedule shown in paragraph (o) of this section, heavy-duty engines intended for use in a heavy-duty vehicle weighing more than 14,000 pounds GVWR must be equipped with an on-board diagnostic (OBD) system capable of monitoring all emission-related engine systems or components during the life of the engine. The OBD system is required to detect all malfunctions specified in paragraphs (g), (h), and (i) of this § 86.010-18 although the OBD system is not required to use a unique monitor to detect each of those malfunctions.

(1) When the OBD system detects a malfunction, it must store a pending, a MIL-on, or a previous-MIL-on diagnostic trouble code (DTC) in the on-

board computer's memory. A malfunction indicator light (MIL) must also be activated as specified in paragraph (b) of this section.

(2) *Data link connector*. (i) For model years 2010 through 2012, the OBD system must be equipped with a data link connector to provide access to the stored DTCs as specified in paragraph (k)(2) of this section.

(ii) For model years 2013 and later, the OBD system must be equipped with a standardized data link connector to provide access to the stored DTCs as specified in paragraph (k)(2) of this section.

(3) The OBD system cannot be programmed or otherwise designed to deactivate based on age and/or mileage. This requirement does not alter existing law and enforcement practice regarding a manufacturer's liability for an engine beyond its regulatory useful life, except where an engine has been programmed or otherwise designed so that an OBD system deactivates based on age and/or mileage of the engine.

(4) *Drive cycle or driving cycle*, in the context of this § 86.010-18, means operation that meets any of the conditions of paragraphs (a)(4)(i) through (a)(4)(iv) of this section. Further, for OBD monitors that run during engine-off conditions, the period of engine-off time following engine shutoff and up to the next engine start may be considered part of the drive cycle for the conditions of paragraphs (a)(4)(i) and (a)(4)(iv) of this section. For engines/vehicles that employ engine shutoff OBD monitoring strategies that do not require the vehicle operator to restart the engine to continue vehicle operation (e.g., a hybrid bus with engine shutoff at idle), the manufacturer may use an alternative definition for drive cycle (e.g., key-on followed by key-off). Any alternative definition must be based on equivalence to engine startup and engine shutoff signaling the beginning and ending of a single driving event for a conventional vehicle. For engines that are not likely to be routinely operated for long continuous periods of time, a manufacturer may also request approval to use an alternative definition for drive cycle (e.g., solely